1 Momentum Interaction Diagrams

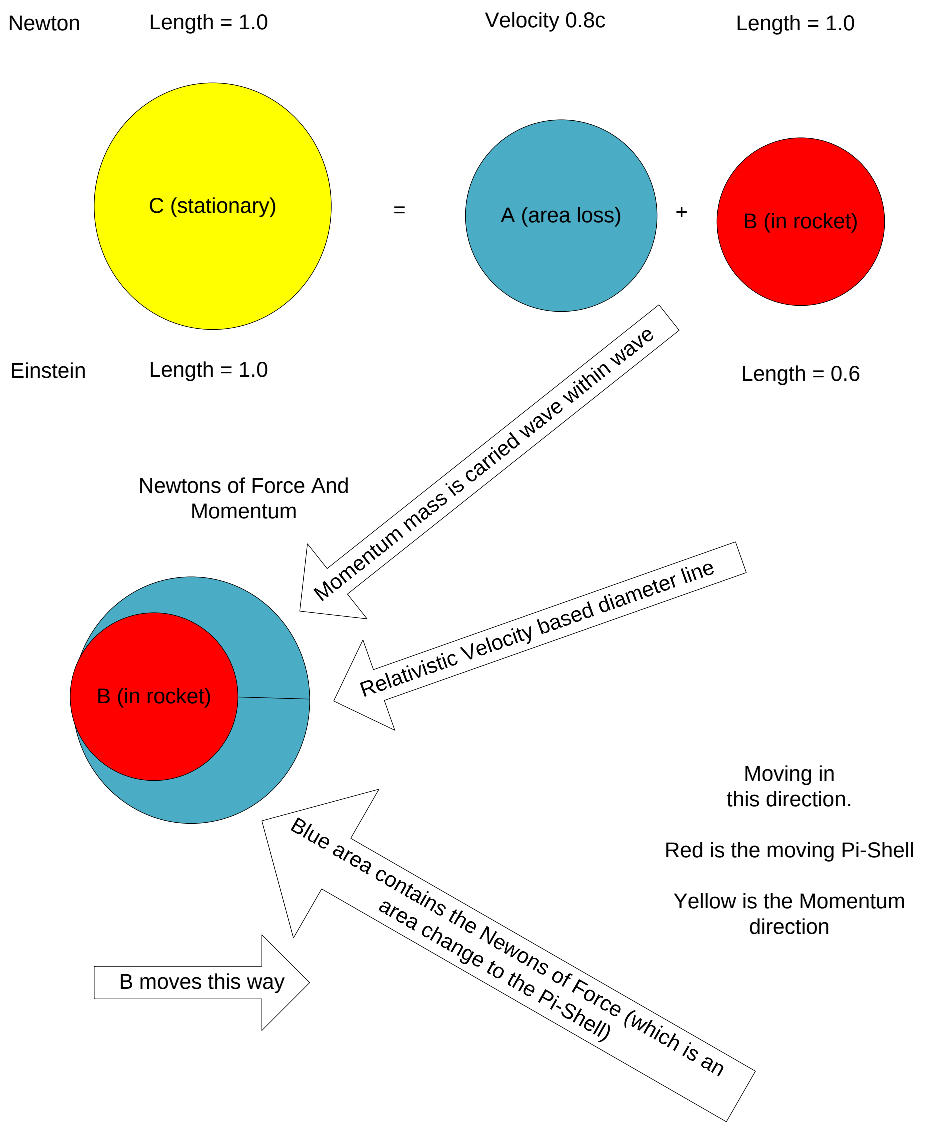
In this section I will cover how Pi-Shells interact with one another. This forms the basis of our reality. In particular I will model the different types of interactions of Pi-Shells. I will cover how they share and distribute momentum and the different types of momentum such as elastic and inelastic. I will also cover solid objects versus fluids and how they distribute momentum. Please read the Particle and Wave documentation and the Introduction to the theory to understand the notation.

Contents

1.1 Modeling Force, Momentum and Relativistic Velocity

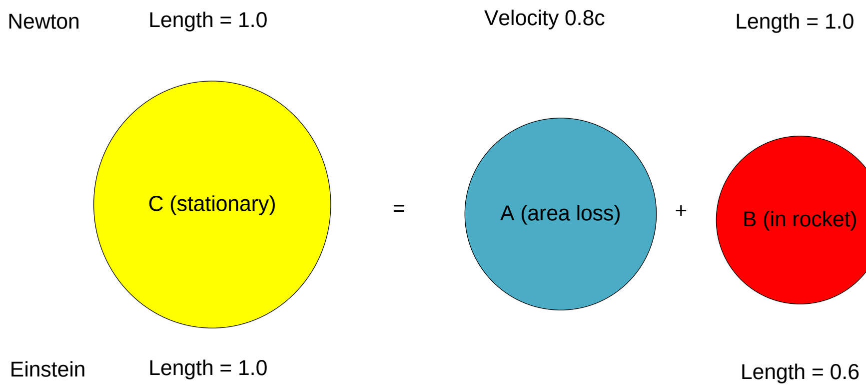
When objects collide there is momentum and force. How can we visualize and understand these concepts? They are all contained in the Pi-Shell and Momentum Shell notation. The momentum waves and associated force area is exchanged between Pi-Shells.

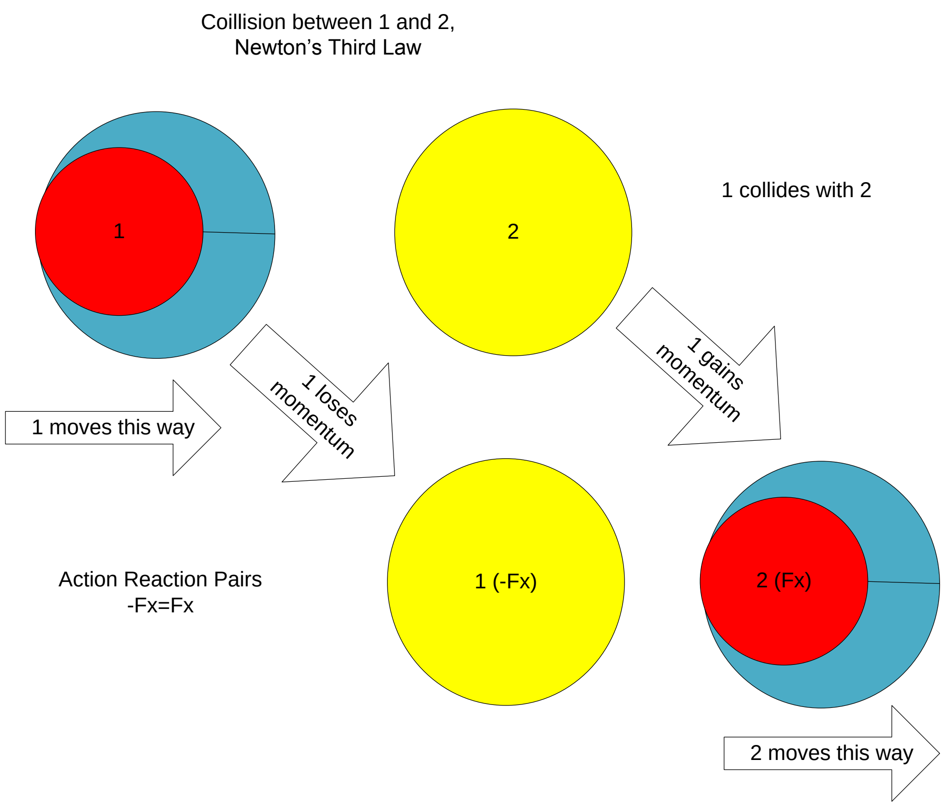
Force is related to momentum by dividing by time. In Pi-Space, this means we are dealing with an area because time is proportional to the diameter so it's like dividing by the diameter squared which is related to the area change of the Pi-Shell.



1.2 Action Reaction Pairs And Newton's Third Law

Newton's Third Law describes Action Reaction pairs between collisions. He states that they are equal and opposite. In the Pi-Space Theory this refers to transfer of force between Pi-Shells where the force is conserved. In the diagram two Pi-Shells collide and transfer force but the total force/area change is conserved. This is how to visualize Newton's Third Law in Pi-Space.



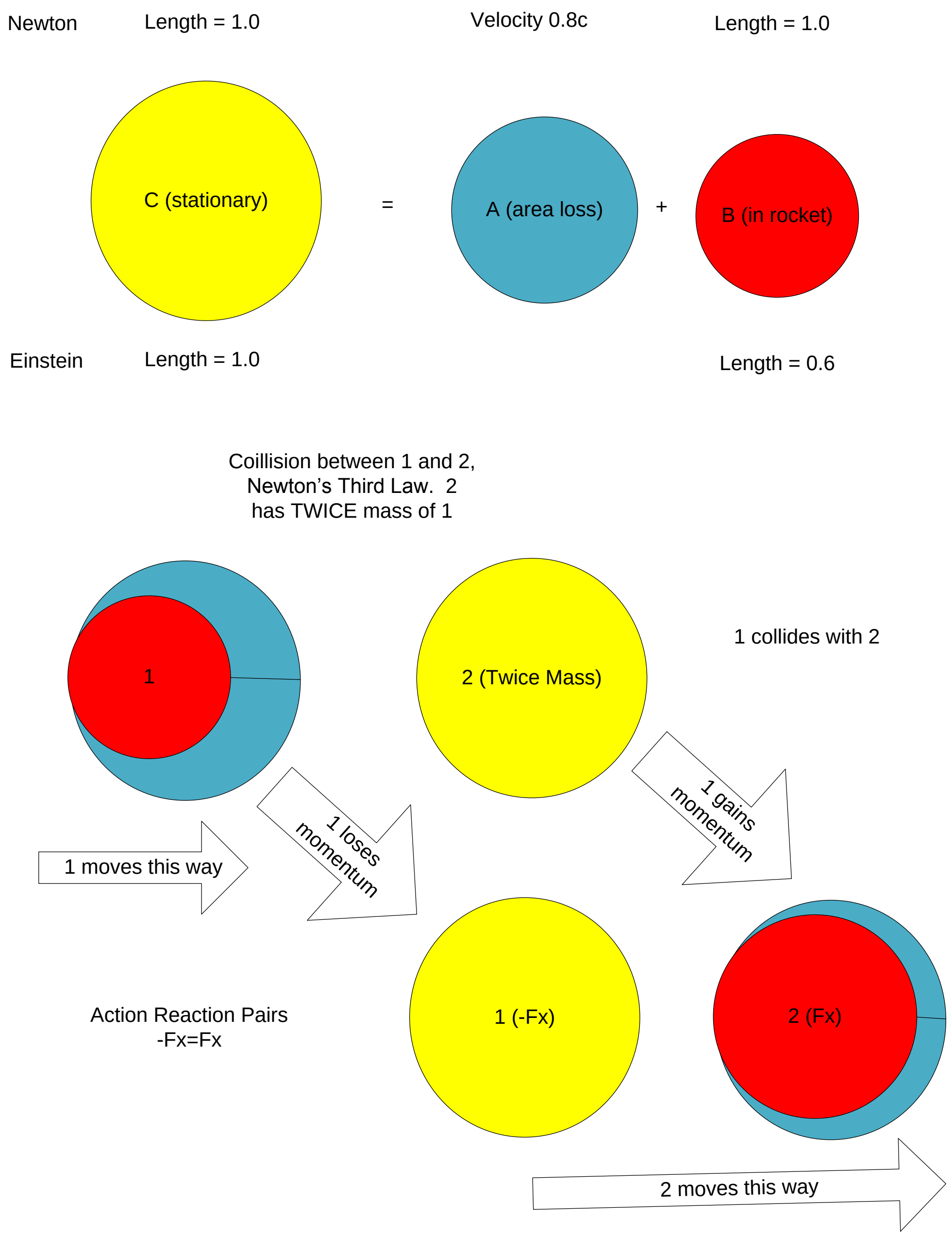


1.3 Conservation of Momentum As Area Change

Mass and Velocity are conserved. When objects collide, the amount of relative mass is important.

Conservation of momentum shows us that m1.v1 = m2.v2

Here we see the second Pi-Shell has twice the mass as the first Pi-Shell. Therefore the area change is not the same but the mass of the momentum waves is higher in that area.



1.4 Conservation of Momentum As Wave Change

The momentum wave area comprises of momentum waves. These are WaveWithinWave and combine mass with velocity. Velocity is the carrier wave and mass is carried by this wave.

When a velocity wave enters a location with relatively more mass, the velocity wave relatively shortens.

Here I will show how we can model Conservation of Momentum in Pi-Space using a wave within notation. The N(cw) stands for Compression Wave. The Ncw(0) is the compression wave which is passed from one Pi-Shell or atom[s] to another and produces the Velocity. The Ncw(1) is mass wave component. The idea is that each atom has a specific compression

wave patttern that it accepts and this can be represented by Newton's Conservation of Momentum law.

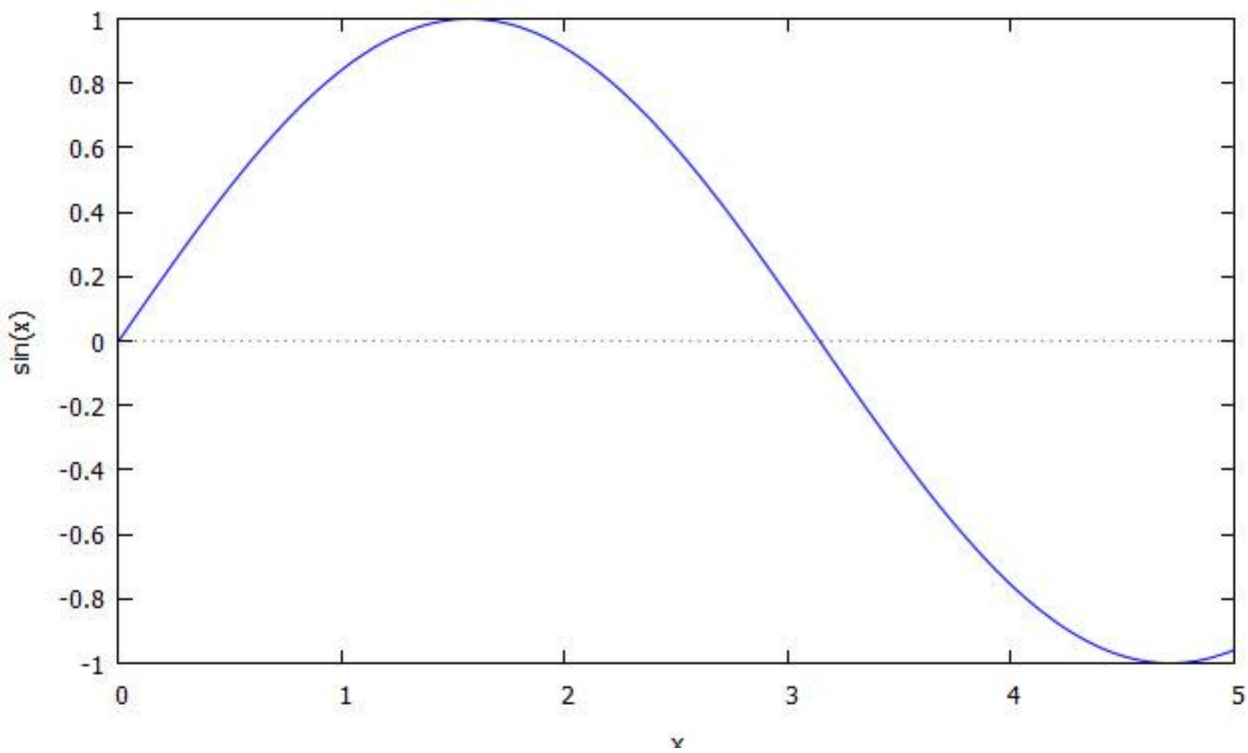
We assume transfer compression waves between atoms/Pi-shells. Notional 5/c speed. Notional total mass of 10 units relating to the object doing the colliding. This is arbitrary.

M1.V1 = M2.V2

Let's first model Ncw(0) with velocity 5.0 which is the range.

Using Maxima Algebra Notation

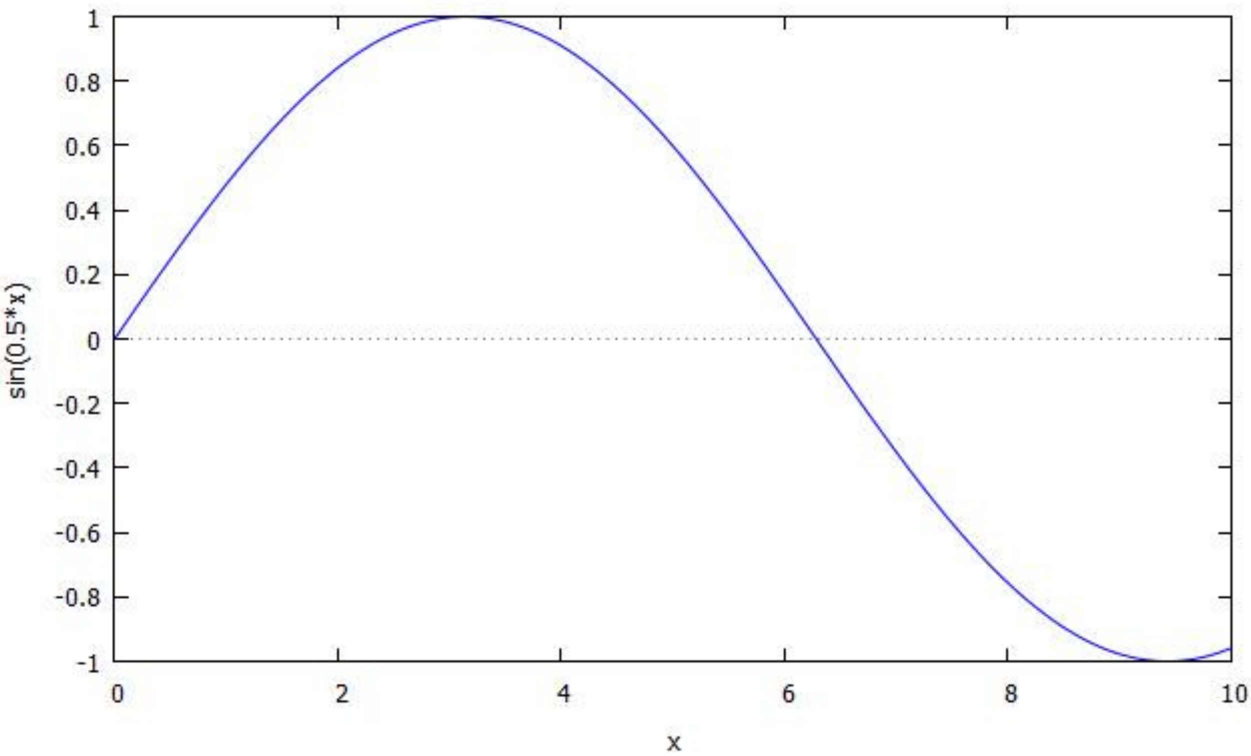
plot2d(sin(x),[x,0.0,5.0]);



This is the same as

plot2d(sin(**0.5***x),[x,0.0,**10.0**]);

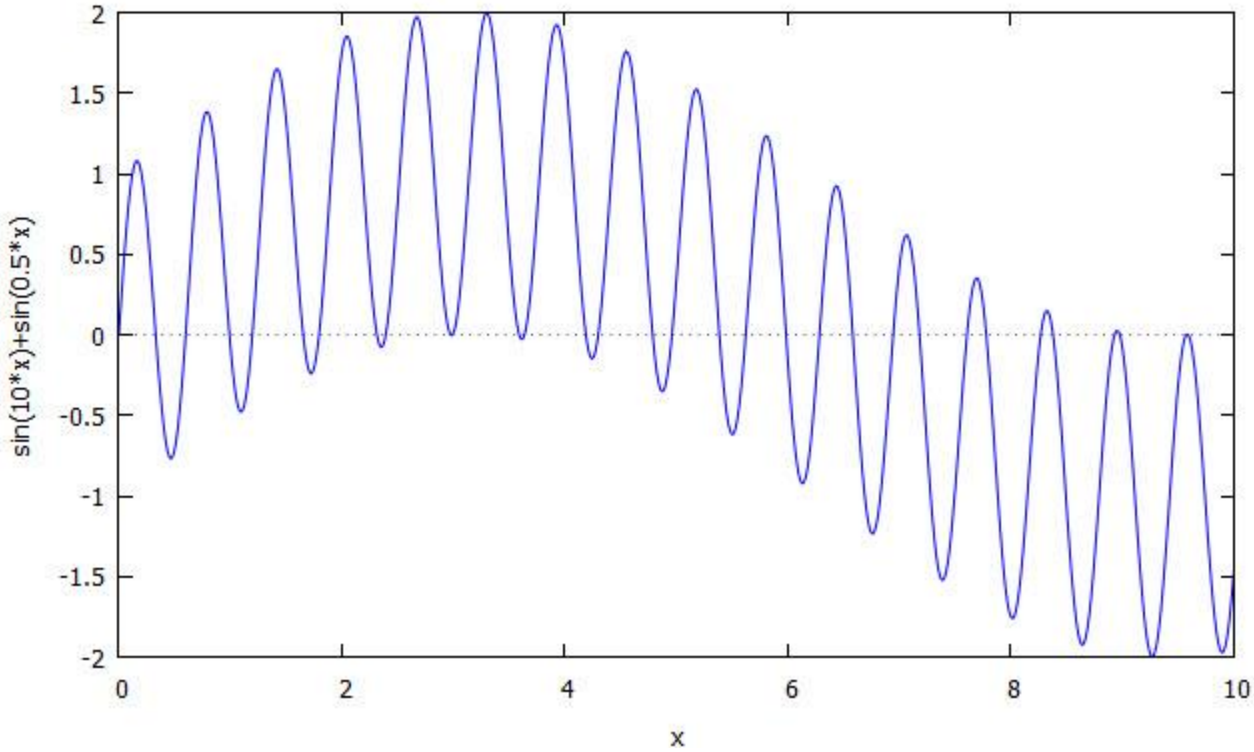
We double the range (velocity) but halve the x value. So range times the relative mass multiplier equals 5.0.



Here we double the range but halve the wave.

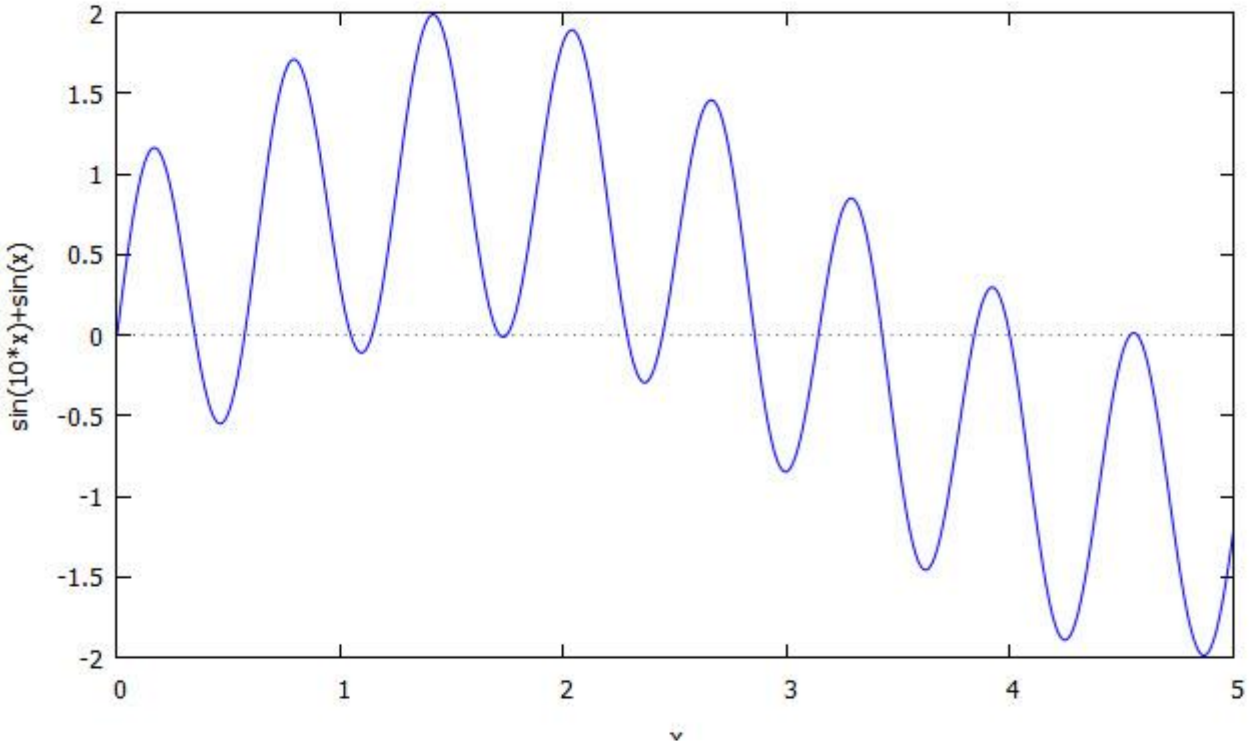
Add mass to represent Ncw(1)

plot2d(sin(0.5*x)+sin(10*x),[x,0.0,10.0]);



same as (conservation)

plot2d(sin(x)+sin(10*x),[x,0.0,5.0]);



We can apply this to Newton's Conservation of Momentum.

So hydrogen->hydrogen = same wave size 5*1 (mass 1:1)

Velocity is 5/c after collision.

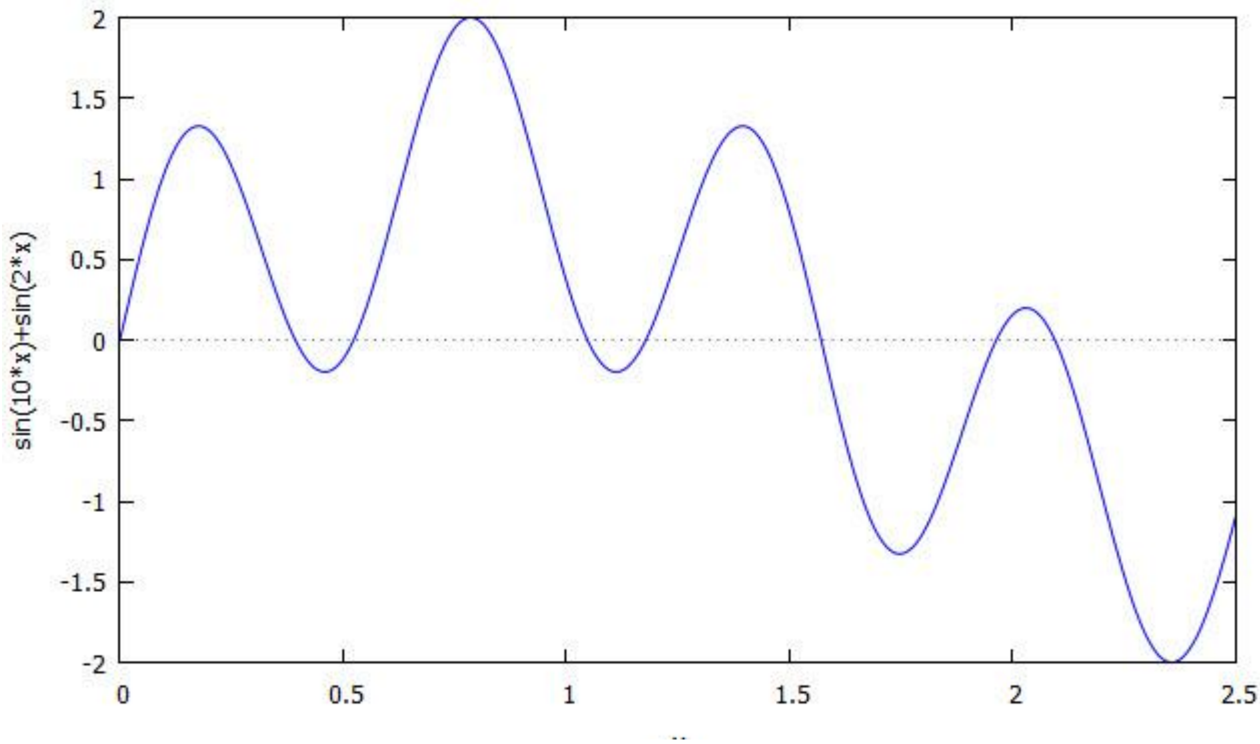
Hydrogen->helium; halve the wave size in terms of its compression effect on helium 10*0.5 (mass 1:2)

Velocity is 2.5/c after collision.

Hydrogen->helius halves the wave size in terms of its compression on hydrogen 2*2.5 (mass 1:2)

Note the larger the wave, the more it compresses and vice versa.

plot2d(sin(2*x)+sin(10*x),[x,0.0,2.5]);



They are all carrying the same momentum so it's conserved but the arrangement of mass and velocity differ.

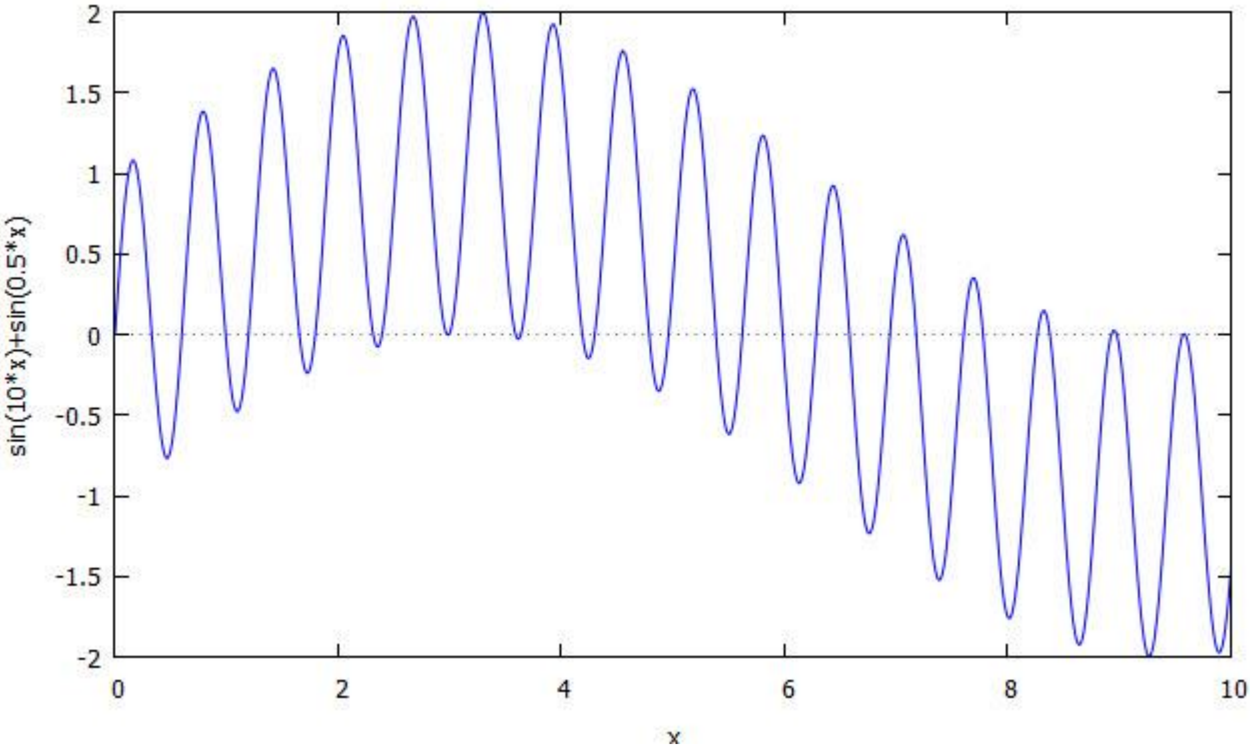
Velocity is 2.5/c after collision.

So the relates to moving at velocity 5/c

Interact with something that has twice the mass like helium we get 2.5/c

Interact with something that has half the mass then we get 10/c

plot2d(sin(0.5*x)+sin(10*x),[x,0.0,10.0]);



Bringing It Together

Note: The range is the velocity 2.5/c, 5.0/c, 10.0/c e.g. [x,0.0,5.0]

First sin wave carries the relative mass. 2x is twice the relative mass. 0.5x is half the relative mass. e.g. sin(2*x)

plot2d(sin(2*x)+sin(10*x),[x,0.0,2.5]);

plot2d(sin(x)+sin(10*x),[x,0.0,5.0]);

plot2d(sin(0.5*x)+sin(10*x),[x,0.0,10.0]);

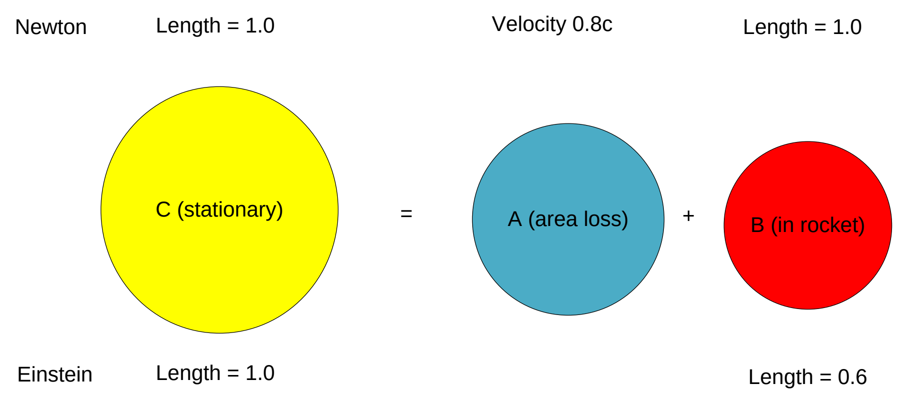
However total momentum is conserved because if we multiply mass times velocity we get 5.0/c

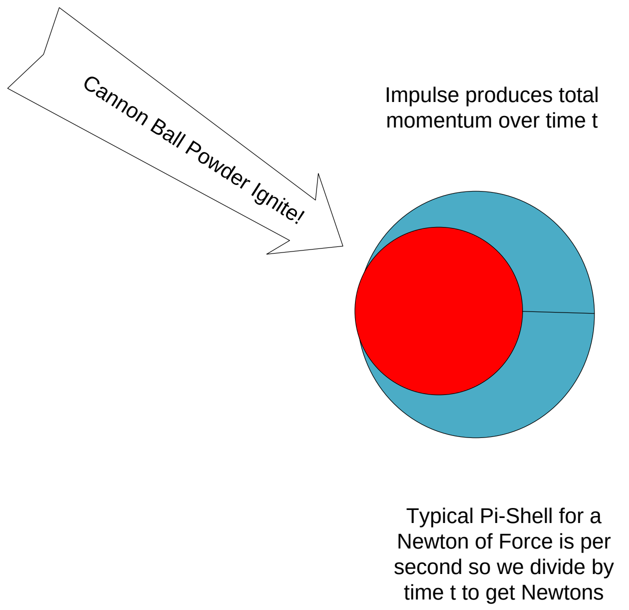
We can see that this alters the wavelength of the Compression Waves which also relates to the Frequency of said waves.

1.5 Impulse Force And The Momentum Shell

The impulse force is the sum of a force over a time period t. In simple terms, one can imagine a cannon with a fuse and the powder in the cannon explodes and releases an impulse force.

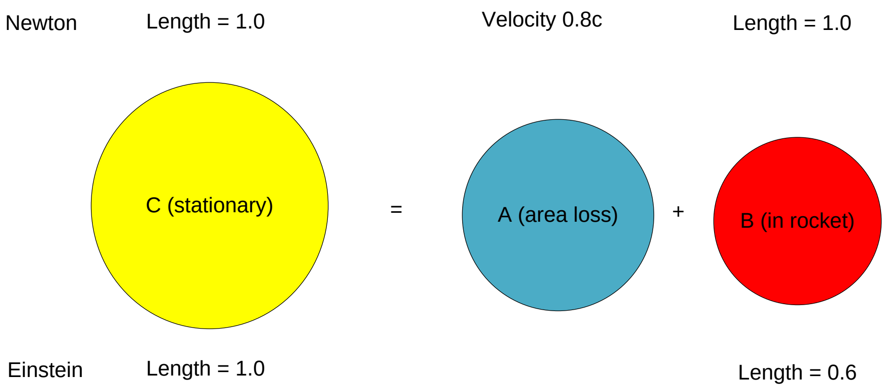
To convert from Impulse force to Newtons we need to divide by time t to get per second. Typically Pi-Shells are per second (but don't have to be but it makes more sense that they are).

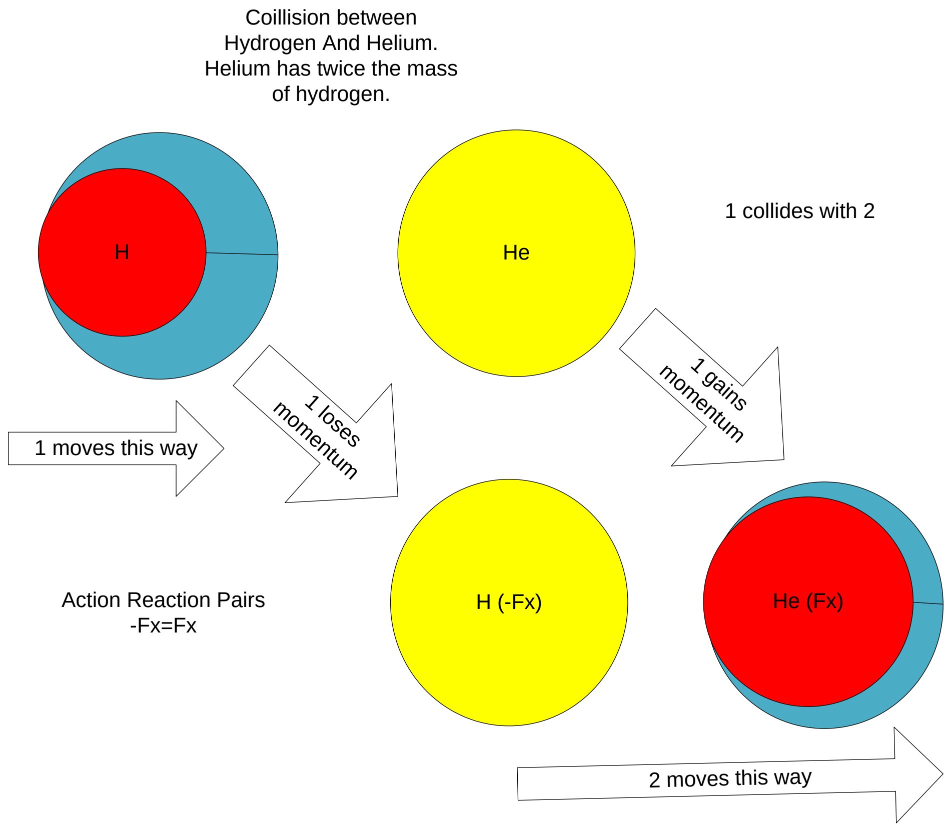




1.6 Momentum Shell And Atom Naming

We can replace the numbering system where we use the Atomic names for the Pi-Shells. We know Helium has twice the mass of Hydrogen so the previous diagram holds in this case. Moving forward we can use the Atomic names of the Atoms/Pi-Shells for the diagrams which makes them a little clearer. Later I will cover molecules and here I will use the atom names placing them in the center of the Pi-Shell.





1.7 Calculating Elastic Collisions In Pi-Space

First we solve for an elastic collision at no angle.

Before collision and after collision

Mass m with velocity.

We have m1 and v1 colliding with m2 and v2. What is v1 final (v3) and v2 final (v4) ?

Conservation of momentum

$$m_1 v_1 + m_2 v_2 = m_1 v' 1 + m_2 v'_2$$

Conservation of energy

$$\frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 = \frac{1}{2} m_1 v'_1 + \frac{1}{2} m_1 v_2'^2$$

Let’s use v3 and v4 for after

Conservation of momentum

$$m_1 v_1 + m_2 v_2 = m_1 v_3 + m_2 v_4$$

Conservation of energy

$$\frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 = \frac{1}{2} m_1 v_3 + \frac{1}{2} m_1 v_4$$

Here v3 = v1f and v4 = v2f.

The Classic Solution for an Elastic Collision.

$$v_{1f} = \frac{m_1 - m_2}{(m_2 + m_1)} v_{1i} + \frac{2m_2}{(m_2 + m_1)} v_{2i}$$

$$v_{2f} = \frac{2m_1}{(m_2 + m_1)} v_{1i} + \frac{(m_2 - m_1)}{(m_2 + m_1)} v_{2i}$$

Let’s solve the Pi-Space way for v3,v4.

Conservation of energy

$$m_1 * ((1 - Cos(ArcSin(\frac{v_1}{c}))) * c * c) + m_2 * ((1 - Cos(ArcSin(\frac{v_2}{c}))) * c * c)$$

$$= m_1 * ((1 - Cos(ArcSin(\frac{v_3}{c}))) * c * c) + m_2 * ((1 - Cos(ArcSin(\frac{v_4}{c}))) * c * c)$$

Move out speed of light

$$c * c * (m_1 * (1 - Cos(ArcSin(\frac{v_1}{c}))) + m_2 * (1 - Cos(ArcSin(\frac{v_2}{c}))))$$
$$= c * c * (m_1 * ((1 - Cos(ArcSin(\frac{v_3}{c}))) + m_2 * ((1 - Cos(ArcSin(\frac{v_4}{c}))))$$

Solving for v3 and v4 knowing v1 and v2

Using Mathematica
Solving Momentum

Solve[m1*v1 + m2*v2 == m1*v3 + m2*v4 , v4]

v4 = ((m1 v1 + m2 v2 - m1 v3)/m2)

Solve[m1*v1 + m2*v2 == m1*v3 + m2*v4, v3]

v3 = (m1 v1 + m2 v2 - m2 v4)/m1)

Solving Kinetic Energy (we know v1,v2, v4)

Solve[(c*c*m1*(1 - Cos[ArcSin[v1]])) + (c*c*
m2*(1 - Cos[ArcSin[v2]])) == (c*c*m1*(1 - Cos[ArcSin[v3]])) + (c*c*
m2*(1 - Cos[ArcSin[v4]])) , v3]

Solving for individual values knowing v1 and v2, not knowing v1final and v2final.

Solve[(c*c*m1*(1 - Cos[ArcSin[v1]])) + (c*c*
m2*(1 - Cos[ArcSin[v2]])) == (c*c*m1*(1 - Cos[ArcSin[v3]])) + (c*c*
m2*(1 - Cos[ArcSin[((m1*v1 + m2*v2 - m1*v3)/m2)]])), v3]

v3 -> (m1^4 v1 - m2^4 v1 + 2 m1^3 m2 v2 - 2 m1 m2^3 v2 +
2 m1^3 m2 v1^2 v2 + 2 m1 m2^3 v1^2 v2 + 6 m1^2 m2^2 v1 v2^2 +
2 m2^4 v1 v2^2 + 4 m1 m2^3 v2^3 -
2 m1^3 m2 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] +
2 m1 m2^3 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] -
2 m1^2 m2^2 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2] +
2 m2^4 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2])/(m1^4 - 2 m1^2 m2^2 +
m2^4 + 4 m1^2 m2^2 v1^2 + 4 m1^3 m2 v1 v2 + 4 m1 m2^3 v1 v2 +
4 m1^2 m2^2 v2^2)

```
Solve[(c*c*m1*(1 - Cos[ArcSin[v1]])) + (c*c*
     m2*(1 - Cos[ArcSin[v2]])) == (c*c*
     m1*(1 - Cos[ArcSin[((m1 v1 + m2 v2 - m2 v4)/m1)]])) + (c*c*
     m2*(1 - Cos[ArcSin[v4]])), v4]
```

```
v4 -> (-2 m1^3 m2 v1 + 2 m1 m2^3 v1 + 4 m1^3 m2 v1^3 - m1^4 v2 +
    m2^4 v2 + 2 m1^4 v1^2 v2 + 6 m1^2 m2^2 v1^2 v2 +
    2 m1^3 m2 v1 v2^2 + 2 m1 m2^3 v1 v2^2 +
    2 m1^4 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] -
    2 m1^2 m2^2 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] +
    2 m1^3 m2 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2] -
    2 m1 m2^3 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2])/(m1^4 - 2 m1^2 m2^2 +
    m2^4 + 4 m1^2 m2^2 v1^2 + 4 m1^3 m2 v1 v2 + 4 m1 m2^3 v1 v2 +
    4 m1^2 m2^2 v2^2)
```

These formulas are more complex but are relativistic according to the Pi-Space Physics Theory.

Worked example

Classic Formula Example

For example:

Ball 1: mass = 3 kg, velocity = 4 m/s
Ball 2: mass = 5 kg, velocity = −6 m/s

After collision:

Ball 1: velocity = −8.5 m/s
Ball 2: velocity = 1.5 m/s

Using the Pi-Space Approach with Mathematica

c = 186000
m1 = 3.0

m2 = 5.0
v1 = 4.0/c
v2 = -6.0/c

```
Solve[(m1*c*c* (1 - Cos[ArcSin[v1]])) + (m2*c*
    c *(1 - Cos[ArcSin[v2]])) == (m1*c*
    c *(1 - Cos[ArcSin[v3]])) + (m2*c*
    c*(1 - Cos[ArcSin[((m1*v1 + m2*v2 - m1*v3)/m2)]])), v3]
```

```
        v3 = (m1^4 v1 - m2^4 v1 + 2 m1^3 m2 v2 - 2 m1 m2^3 v2 +
  2 m1^3 m2 v1^2 v2 + 2 m1 m2^3 v1^2 v2 + 6 m1^2 m2^2 v1 v2^2 +
  2 m2^4 v1 v2^2 + 4 m1 m2^3 v2^3 -
  2 m1^3 m2 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] +
  2 m1 m2^3 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] -
  2 m1^2 m2^2 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2] +
  2 m2^4 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2])/(m1^4 - 2 m1^2 m2^2 +
  m2^4 + 4 m1^2 m2^2 v1^2 + 4 m1^3 m2 v1 v2 + 4 m1 m2^3 v1 v2 +
  4 m1^2 m2^2 v2^2)
```

To get back to Newton velocity we need to multiply by speed of light. So multiply v3 by c.

```
v3 = (m1^4 v1 - m2^4 v1 + 2 m1^3 m2 v2 - 2 m1 m2^3 v2 +
  2 m1^3 m2 v1^2 v2 + 2 m1 m2^3 v1^2 v2 + 6 m1^2 m2^2 v1 v2^2 +
  2 m2^4 v1 v2^2 + 4 m1 m2^3 v2^3 -
  2 m1^3 m2 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] +
  2 m1 m2^3 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] -
  2 m1^2 m2^2 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2] +
  2 m2^4 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2])  / (m1^4 - 2 m1^2 m2^2 +
  m2^4 + 4 m1^2 m2^2 v1^2 + 4 m1^3 m2 v1 v2 + 4 m1 m2^3 v1 v2 +
  4 m1^2 m2^2 v2^2)*c
```

This produces -8.5 which matches the Classic Formula

```
In[7]:= c = 186000
        m1 = 3.0
        m2 = 5.0
        v1 = 4.0 / c
        v2 = -6.0 / c

        v3 =
         (m1^4 v1 - m2^4 v1 + 2 m1^3 m2 v2 - 2 m1 m2^3 v2 + 2 m1^3 m2 v1^2 v2 + 2 m1 m2^3 v1^2 v2 + 6 m1^2 m2^2 v1 v2^2 + 2 m2^4 v1 v2^2 +
             4 m1 m2^3 v2^3 - 2 m1^3 m2 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] + 2 m1 m2^3 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] -
             2 m1^2 m2^2 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2] + 2 m2^4 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2]) /
           (m1^4 - 2 m1^2 m2^2 + m2^4 + 4 m1^2 m2^2 v1^2 + 4 m1^3 m2 v1 v2 + 4 m1 m2^3 v1 v2 + 4 m1^2 m2^2 v2^2) * c

Out[7]= 186000

Out[8]= 3.

Out[9]= 5.

Out[10]= 0.0000215054

Out[11]= -0.0000322581

Out[12]= -8.5
```

v4 =(-2 m1^3 m2 v1 + 2 m1 m2^3 v1 + 4 m1^3 m2 v1^3 - m1^4 v2 +
m2^4 v2 + 2 m1^4 v1^2 v2 + 6 m1^2 m2^2 v1^2 v2 +
2 m1^3 m2 v1 v2^2 + 2 m1 m2^3 v1 v2^2 +
2 m1^4 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] -
2 m1^2 m2^2 v1 Sqrt[1 - v1^2] Sqrt[1 - v2^2] +
2 m1^3 m2 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2] -
2 m1 m2^3 Sqrt[1 - v1^2] v2 Sqrt[1 - v2^2])/(m1^4 - 2 m1^2 m2^2 +
m2^4 + 4 m1^2 m2^2 v1^2 + 4 m1^3 m2 v1 v2 + 4 m1 m2^3 v1 v2 +
4 m1^2 m2^2 v2^2)*c

This produces 1.5 which is also correct.

TODO: For the interested student. Can v3 and v4 be solved with a different possibly simpler formula?

1.8 Calculating Elastic Collisions In Pi-Space At An Angle

Previously I solved the direct collisions which are Elastic Collisions.

How can we solve for collision at an angle?

There are two established approaches.

One is to use the dot product another is to determine the collision angle.

For the purposes of this document I will consider the collision angle.

The algorithm is to determine the collision angle, then rotate the x Axis so that it matches the collision angle. Once this is done, calculate the elastic collision in the x direction and then rotate back.

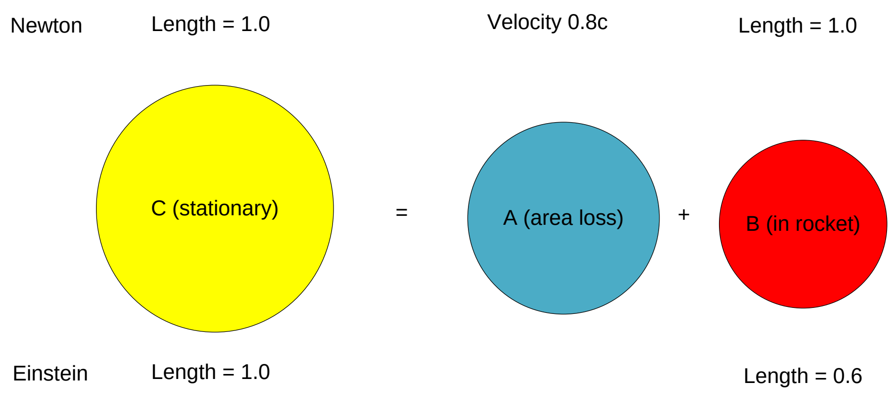
This is not Pi-Space per se and the algorithm is implemented in the Pi-Space software.

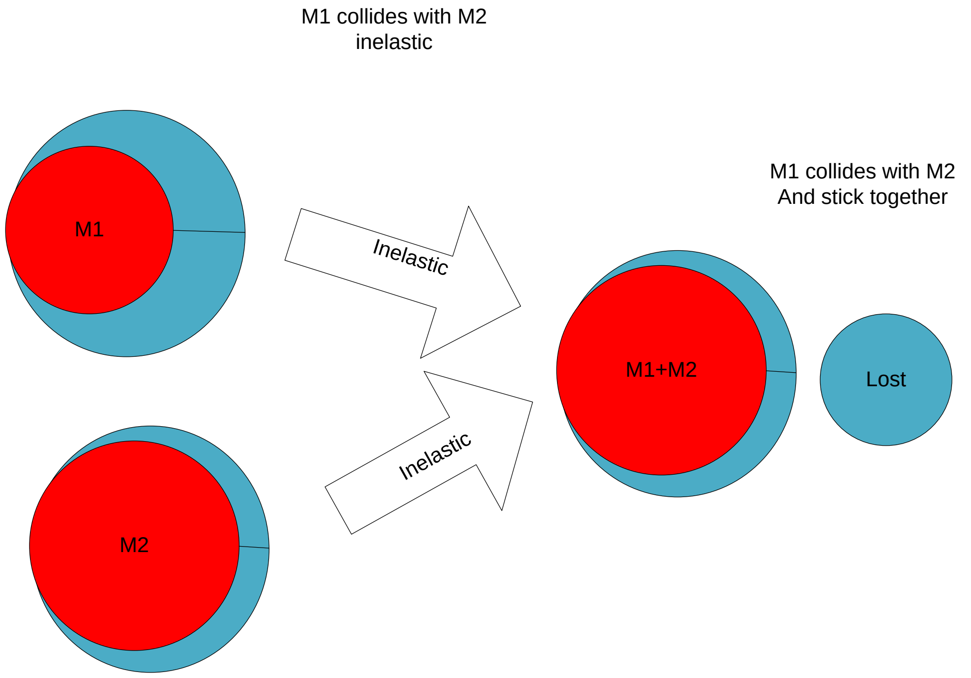
This approach can also be used for inelastic collisions.

1.9 Calculating Inelastic Collisions In Pi-Space

In an inelastic collision, some energy is lost in the collision.

The final velocity is a combination of the masses of both objects where the join together to form one object.





This type of collision is an energy release equation.

Let’s solve this in Classic and Pi-Space.

Classic

```
In[1]:= Solve[(0.5 * m1 * v1 * v1) + (0.5 * m2 * v2 * v2) ==
          excessEnergy +
           ((((m1 * v1 + m2 * v2) / (m1 + m2))) * (((m1 * v1 + m2 * v2) / (m1 + m2))) *
             (m1 + m2) * 0.5), excessEnergy]
```

$$\text{Out[1]= } \left\{\left\{\text{excessEnergy} \to -1. \left(-0.5\, m1\, v1^2 - 0.5\, m2\, v2^2 + \frac{0.5\,(m1\, v1 + m2\, v2)^2}{m1 + m2}\right)\right\}\right\}$$

{{excessEnergy -> -1. (-0.5 m1 v1^2 - 0.5 m2 v2^2 + (
    0.5 (m1 v1 + m2 v2)^2)/(m1 + m2))}}

Pi-Space

CC is C^2
Also we use Abs[] for Velocity because we add up the energies.

```
In[2]:= Solve[
         (cc * m1 * (1 - Cos[ArcSin[Abs[v1]]])) +
           (cc * m2 * (1 - Cos[ArcSin[Abs[v2]]])) ==
          (lostEnergy) +
           (cc * (m1 + m2) * (1 - Cos[ArcSin[Abs[((m1 * v1 + m2 * v2) / (m1 + m2))]]])),
         lostEnergy]
```

$$\text{Out[2]= } \left\{\left\{\text{lostEnergy} \to -cc\, m1 \sqrt{1 - \text{Abs}[v1]^2} - cc\, m2 \sqrt{1 - \text{Abs}[v2]^2} + cc\, m1 \sqrt{1 - \text{Abs}\left[\frac{m1\, v1 + m2\, v2}{m1 + m2}\right]^2} + cc\, m2 \sqrt{1 - \text{Abs}\left[\frac{m1\, v1 + m2\, v2}{m1 + m2}\right]^2}\right\}\right\}$$

{{lostEnergy -> -cc m1 Sqrt[1 - Abs[v1]^2] -
   cc m2 Sqrt[1 - Abs[v2]^2] +
   cc m1 Sqrt[1 - Abs[(m1 v1 + m2 v2)/(m1 + m2)]^2] +
   cc m2 Sqrt[1 - Abs[(m1 v1 + m2 v2)/(m1 + m2)]^2]}}

Worked Example

Two objects 2300kg at 22 mph collides with 780kg at 26 mph. What is the energy loss?

Classic

```
c=186000
m1=2300
v1=22
m2=780
v2=-26.0
```

```
Solve[(0.5*m1*v1*v1)+(0.5*m2*v2*v2)==excessEnergy+((((m1*v1+m2*v2)/(m1+m2)))*(((m1*v1+m2*v2)/(m1+m2)))*(m1+m2)*0.5),excessEnergy]
```

```
{{excessEnergy→671003.}}
```

Pi-Space

```
c=186000
m1=2300
v1=22/c
m2=780
v2=-26.0/c
cc=c*c
```

Solve[(cc∗m1∗(1−Cos[ArcSin[Abs[v1]]]))+(cc∗m2∗(1−Cos[ArcSin[Abs[v2]]]))==(lostEnergy)+(cc∗(m1+m2)∗(1−Cos[ArcSin[Abs[((m1∗v1+m2∗v2)(m1+m2))]]])),lostEnergy]

```
{{lostEnergy→671003.}}
```

1.10 Calculating Relativistic Momentum In Pi-Space

In Pi-Space so far, the momentum formula I have used is the Classic one.

Conservation of momentum

$$m_1 v_1 + m_2 v_2 = m_1 v'_1 + m_2 v'_2$$

However, we need to consider the case where the Momentum is relativistic e.g. 0.6 and 0.7C. The Kinetic Energy formula already takes care of this but not the Momentum.

To do this in Pi-Space, we use the Einstein addition approach. This formula looks as follows based on the Einstein idea.

Conservation of momentum in Pi-Space. Velocity is a fraction of C.

$$\frac{m_1 v_1 + m_2 v_2}{1 + v_1 v_2} = \frac{m_1 v'_1 + m_2 v'_2}{1 + v'_1 v'_2}$$

The reason for doing this division is that we want the result to be represented in terms of the stationary observer. In the case where v << C we don't need to do this because the divisor is mostly 1.0. However in the case where v < C we do otherwise because we can have a combined velocities of 1.3C. Please read the Introduction to the Theory for an explanation of the Einstein Velocity Addition formula and how to visualize and interpret it in Pi-Space. Basically we need a velocity result which is < 1.0C and is relative to the stationary observer e.g. the person sitting in some kind of control room doing measurements so the divisor is important. In Pi-Space the mass is seen as a wave within the velocity wave so applying this to the velocity is ok as the mass is also automatically shortened and we don't need special handling for mass. I realize this may differ from established theories but this is how Pi-Space does it. Mass is seen as the Non-Local wave carried on the Velocity wave.

Therefore, the previous derived formulas for Pi-Space Elastic and Inelastic need to use this formula. For the moment, I leave this to the interested student for the previous cases. I may revisit this later.

For an Inelastic collision the momentum formula is

$$\frac{m_1 v_1 + m_2 v_2}{1 + v_1 v_2} = \frac{(m_1 + m_2) v_3}{1}$$

Therefore Inelastic velocity in Pi-Space is

$$v_3 = \frac{m_1 v_1 + m_2 v_2}{(1 + v_1 v_2)(m_1 + m_2)}$$

1.11 Calculating Velocity Addition in Pi-Space

In Pi-Space so far, we have an Einstein addition equation. The Pi-Space approach is similar where we consider the area change and represent it in terms of a diameter. Essentially we end up with the same value as the Einstein one so all is good with this formula.

1.12 Determining Momentum With Charge in Pi-Space

In Pi-Space so far, the design approach is to apply Momentum Interaction diagrams to Charged Particles as well as non-charged particles.

To do this we need to understand which aspect of Charged Particles relates to Momentum.

The answer in Pi-Space is that Magnetic Fields relate to Momentum Change of the Particle in terms of a Field effect. This is because a charged particle needs to **move** in order to generate a Magnetic Field.

The relationships are as follows

Particle Effect	Field Effect
Stationary Charge	Electric Field
Movement of charge (velocity)	Magnetic Field (Momentum Interaction)
Acceleration of charge (acceleration)	EM Wave Generation

So, momentum is a velocity component. Therefore a Magnetic Field can be seen as a Momentum Interaction.

Generating an EM wave for Radio Waves requires an acceleration of the charge so this is a change in area with respect to time of the Charge Particle and not a Momentum Interaction.

1.13 Momentum Exchange In Fluids And Bernoulli in Pi-Space

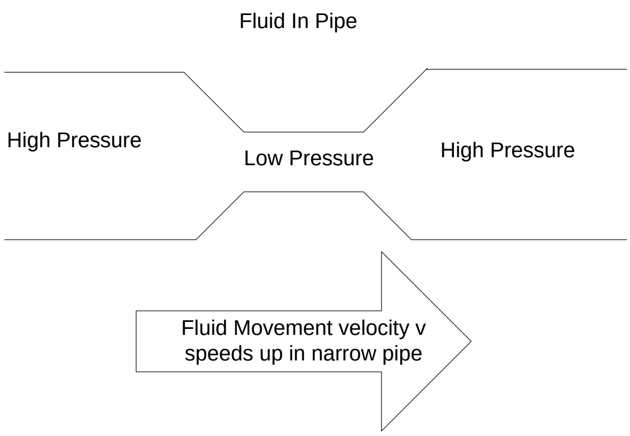
In Pi-Space momentum exchange in fluids are a case of Momentum Addition between particles. I have already covered this in the Advance Pi-Space but here I will be explaining it in terms of Momentum Exchange diagrams.

Daniel Bernoulli explained the Mathematical idea of why a fast velocity equals low pressure.

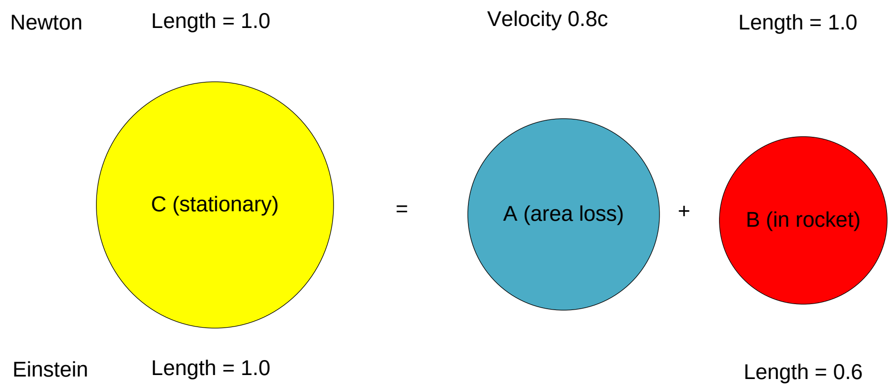
He explained that for an Incompressible fluid in a streamline, that the total energy of that streamline is constant.

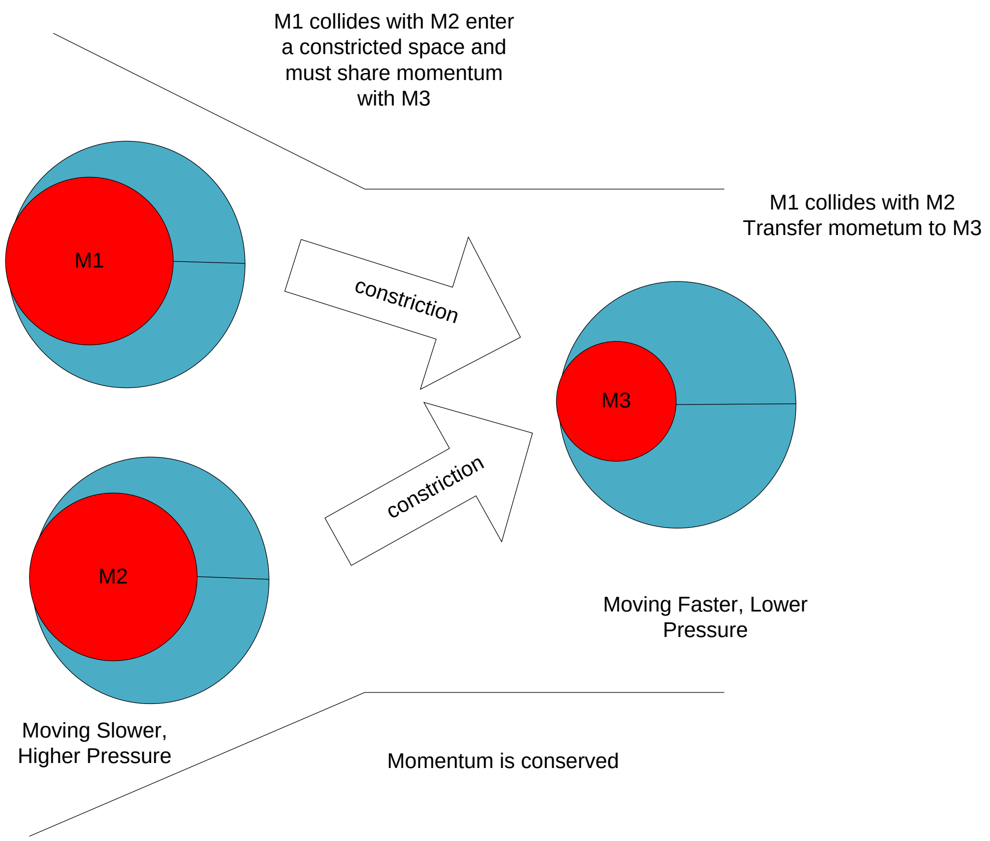
$$\frac{v^2}{2} + gz + \frac{p}{\rho} = const$$

If a fluid containing stream lines moves into a narrowing tube, then the velocity picks up and pressure drops.



The idea here is a pretty simple one, we have molecules with Momentum moving into a constricted space and therefore they need to exchange the Momentum.

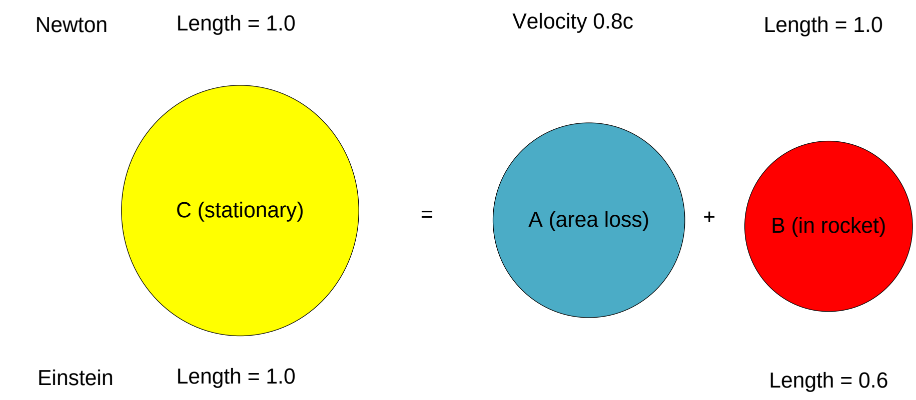


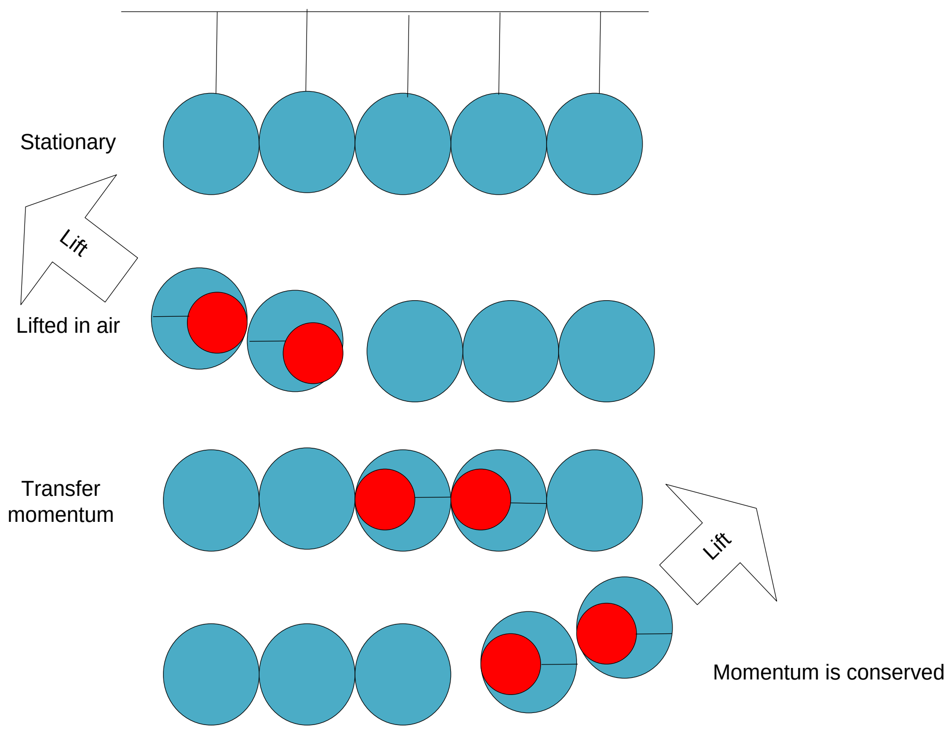


1.14 Momentum Exchange In Newton's Cradle in Pi-Space

In Pi-Space momentum exchange in Newton's cradle is an interesting case because it not only conserves Momentum but the **geometry of the momentum wave**. So when two metal balls are lifted and they transport their momentum to the other side, the wave does not combine but retains its geometric length. The balls have the same mass and size.

The Gravitational Potential can be thought of as a down line under the particle. I did not draw it here in order to highlight momentum.

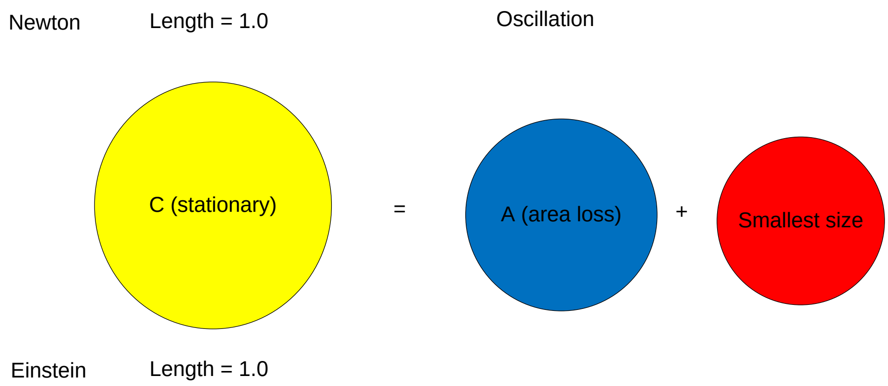


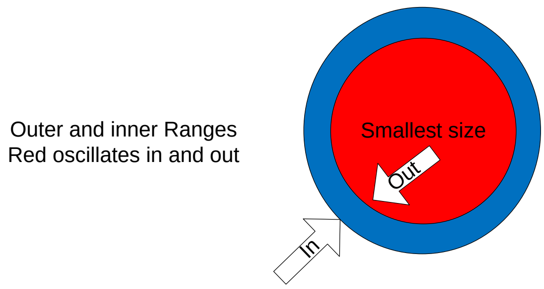


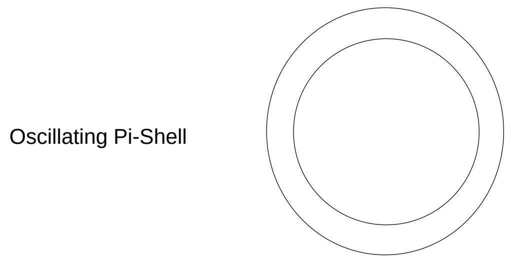
1.15 Defining A notation for Pi-Shells That Oscillate

When a Pi-Shell or Atom containing charge oscillates by means of an acceleration or deceleration in the form of Alternating Current, we need to define a notation which can demonstrate this behavior. Presently, the Momentum Diagrams usually indicate some kind of momentum or movement. In this case the atom is stationary and oscillating at all points or “vibrating”. Therefore, we can draw aPi-Shell with Oscillation ranges which can be drawn as

two rings. This notation just means that the Pi-Shell is oscillating on these ranges and is a form of area change mapping to a potential.



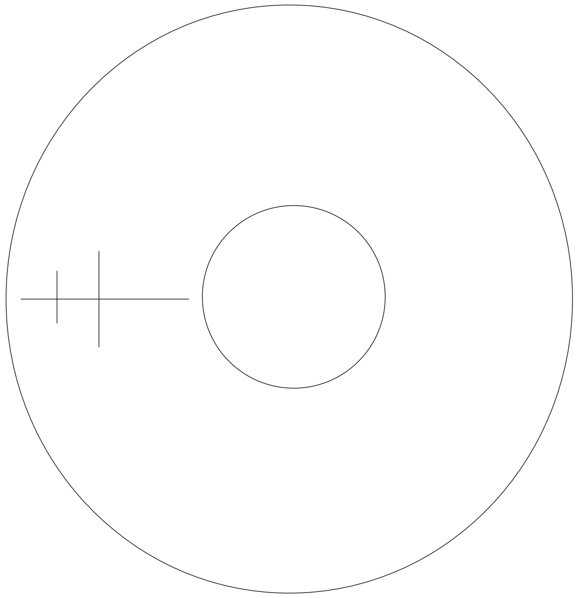




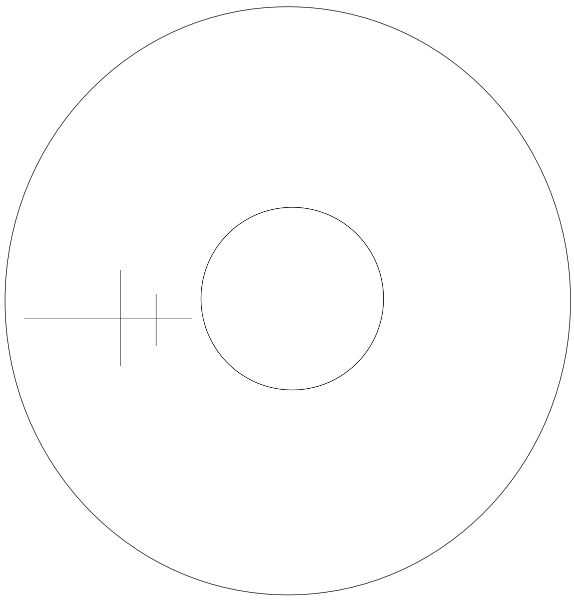
If we want to define how fast or slow it is oscillating then the next step is to define some notation for this. Also importantly, when a charged Pi-Shell oscillates it emits an EM wave.

1.16 Oscillate Inward And Outward Notation

When a Pi-Shell or Atom containing charge oscillates we need to define a notation for inward movement and outward movement. This is a single line with two perpendicular lines one larger and then smaller. The relative shortening represents the direction of oscillation.



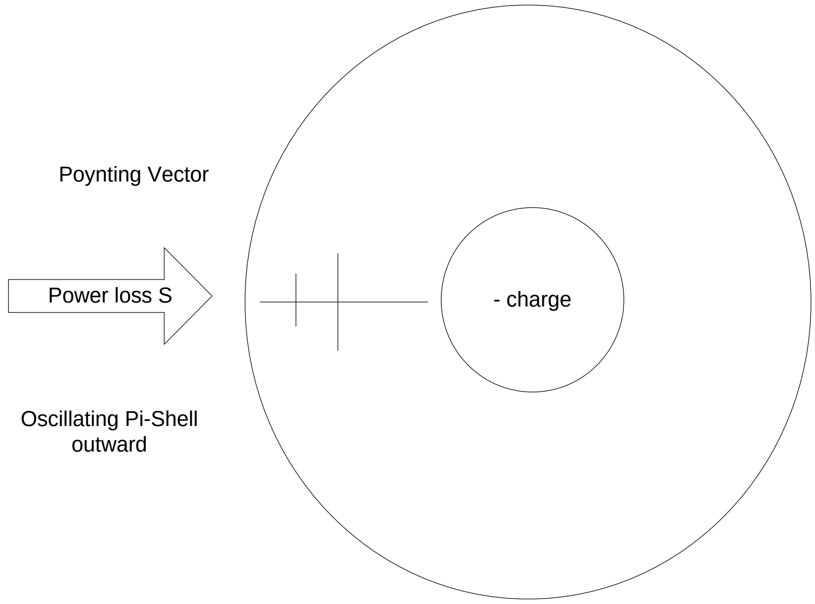
Oscillating Pi-Shell
outward



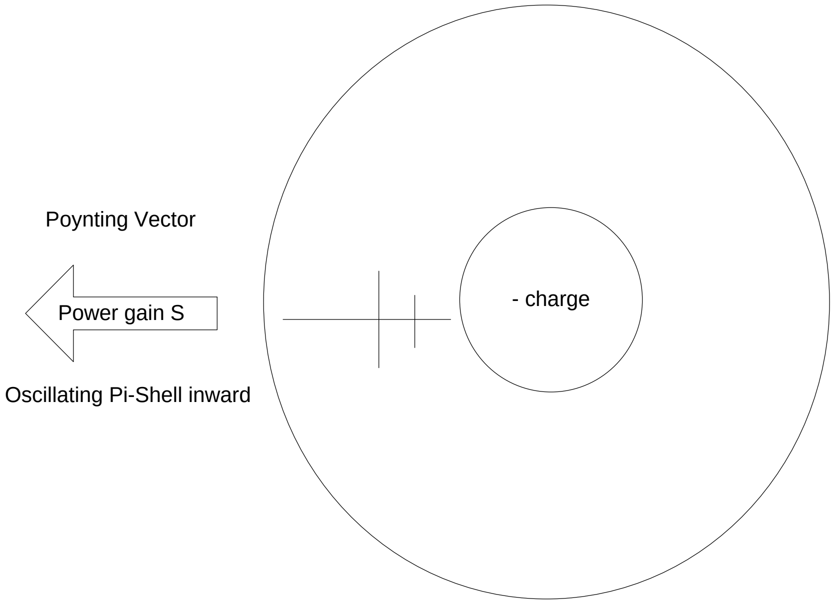
Oscillating Pi-Shell inward

1.17 Poynting Vector And Charged Pi-Shells

When a Pi-Shell or Atom containing charge oscillates we need to map this to a charged Pi-Shell notation . This maps to the Poynting Vector. When the Pi-Shell gets smaller, it loses energy so the Poynting Vector points outwards. When the Pi-Shell gets larger, it gains energy so the Poynting Vector points inwards.



Pi-Shell that oscillates and gets smaller release power and vice versa (electron negatively charged)



The formula for the Poynting Vector turns the power into an Electric and Magnetic form which is how the power is expressed.

$$\mathbf{S} = \frac{1}{\mu_0}\mathbf{E} \times \mathbf{B},$$

1.18 Speed of Interaction Waves Limits

The speed of an interaction wave is limited by the maximum speed of the slowest wave for wave within wave.

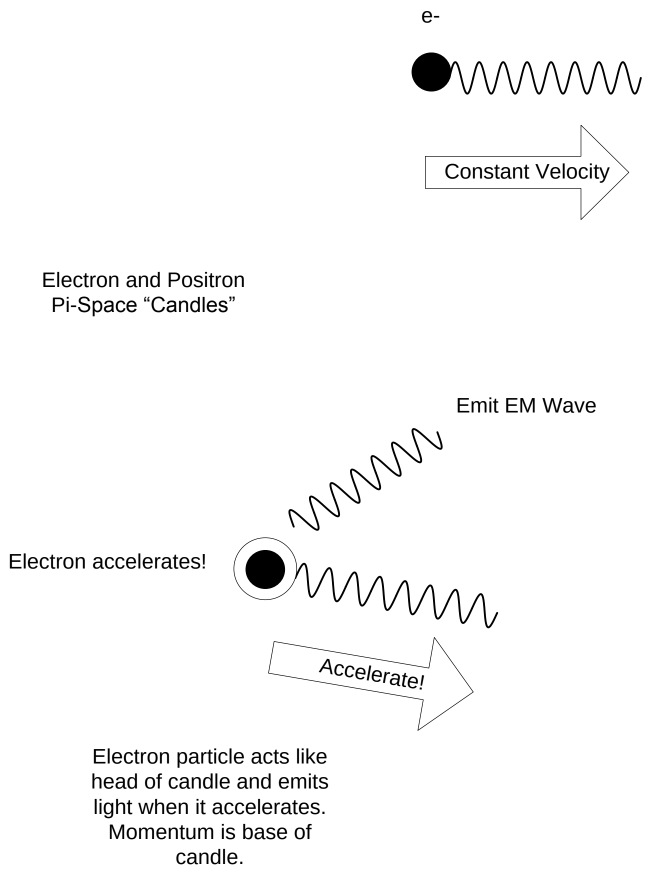
For example, a wave in a pool can travel at jet liner speeds which are a local wave speed.

An EM wave travels at the speed of light because the maximum speed of a local wave is the speed of light. It contains Non Local charge wave which can travel at > C but the local wave constrains it.

In the case of Spooky Action at a distance, we do not have a local wave so we can travel at faster than the speed of light.

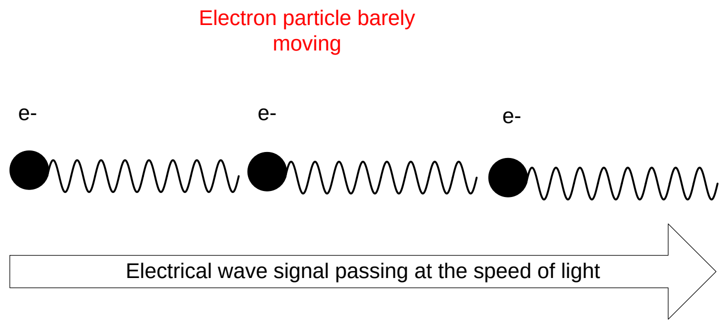
1.19 EM Waves And Pi-Space Candles

A charged particle emitting an EM wave is modeled in Pi-Space as a Pi-Space “candle”. The idea is that the accelerating charge is the head of the candle. It shrinks based on Lorentz contraction. The base of the candle is the momentum wave. The emitted light is the light from the charge at the top of the “candle”. This type of EM emission typical in particle accelerators, radio antennas and astrophysical bodies for example. Anti-particles should also emit waves as well in the theory.



1.20 Electrical Wave Signal Speed

The electrical wave is known to travel at the speed of light. The particle electron can barely moves in a wire. Therefore in Pi-Space we associate the signal with the momentum component and the Voltage which is a potential difference which maps to the momentum component. We can draw a simple momentum diagram as follow where the wave moves and the particle remains almost stationary. Later I will show how this is similar to a wave in water but the speed is different. The electron wave carries charge type waves which are Non Local so the wave has the fastest slowest wave possible which is the speed of light in Local Space according to the Pi-Space Theory.



calculated the non-relative formula for this. What he did was calculate the area change due to the Poynting Vector and integrated over the whole Pi-Shell/sphere.

The field around the charge becomes distorted. And this area change is what the formula represents using a classical treatment due to J.J. Thomson and revived by Malcolm Longair. This is a primitive form of Pi-Space image of an oscillating Pi-Shell or one experiencing area change due to acceleration.

The formula we get in CGS is

$$Power = \frac{2}{3}\frac{q^2 a^2}{c^3}$$

Note: This is a pretty interesting formula because we are dividing four dimensional space (area squared) by three dimensional space to find the space that the power moves through carrying both electrical and magnetic energy which are perpendicular to one another.

The Pi-Space version of this uses the Pi-Space Gamma value for acceleration for this where we need to know the start and end velocity.

$$Power = \frac{2}{3}\frac{q^2 a^2}{c^3}\alpha$$

Where Pi-Space $acceleration = \frac{v_2 - v_1}{t}\alpha$

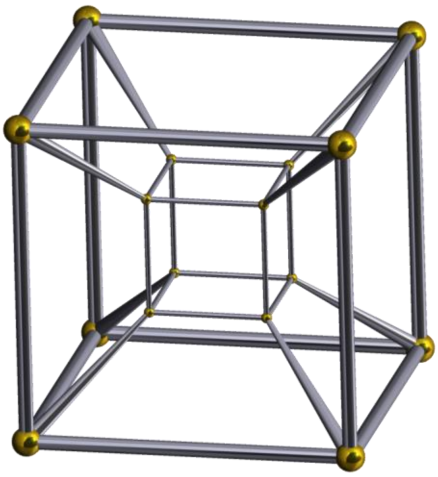
And a simple version of this is (one can also use integration)

$$\alpha = \frac{Sin(v_2') - Sin(v_1')}{v_2' - v_1'}$$

As one moves closer to the speed of light then the gamma value tends to 0. See the Advanced Formulas for more detail. The Liénard–Wiechert potential formula instead uses the Lorentz Fitzgerald transformation but we don't need this for Pi-Space. I leave it to the interested student to figure out how Pi-Space could work here.

1.21 EM Waves In The Fourth Dimension In Pi-Space

The Tesseract is a cube in the fourth dimension. We can use this to model EM wave power in three dimensional Pi-Space.

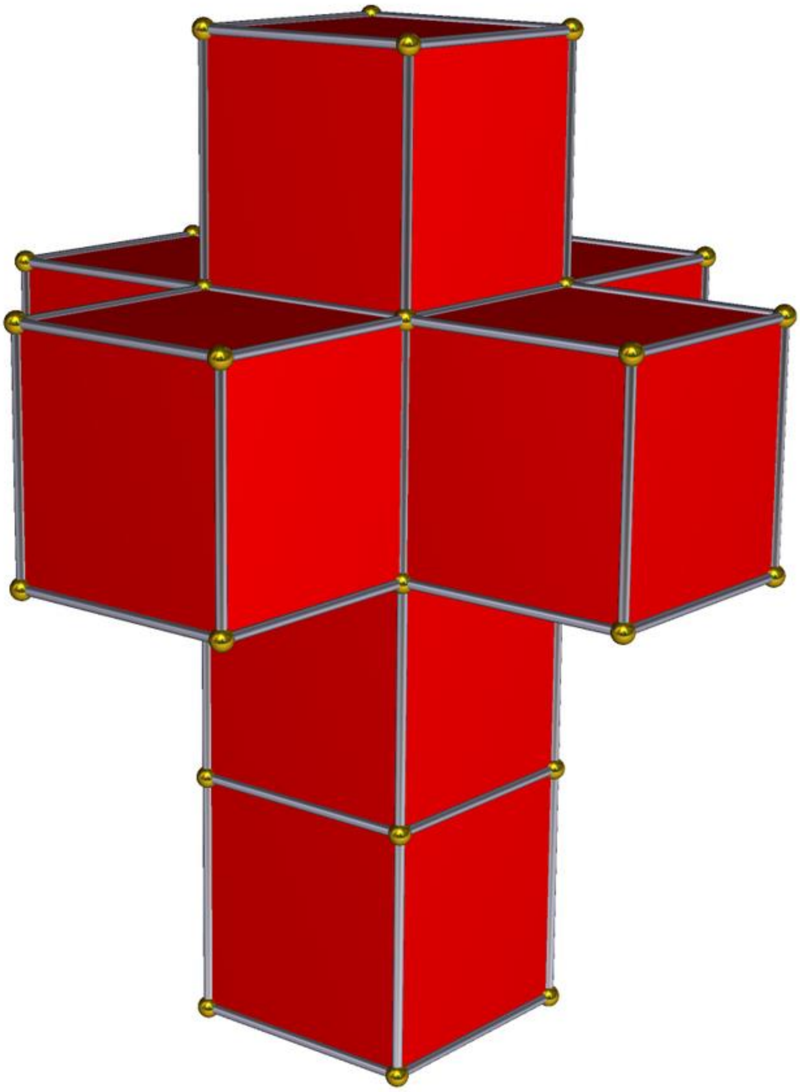


The central three dimensional cube is our reality where we see and measure a three dimension Pi-Shell. The outer cubes make up the fourth dimension. This is the charge squared. However, we cannot "see" the fourth dimension but it does interact with the third dimension. The outer cube is the charge squared and the inner cube is c cubed from the Larmor formula.

$$Power = \frac{2}{3}\frac{q^2 a^2}{c^3}\alpha$$

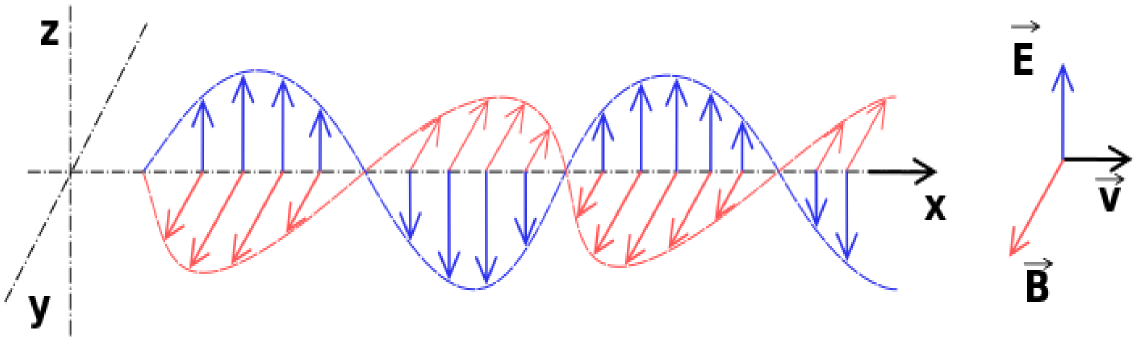
We can model these surrounding cubes from the three dimensional reality in the following way where they are at right angles to any point in our three dimensional space, forming eight

cell boxes. Our three dimensional reality is in the center of the eight cell. In this theory, this structure is the basis of the Left and Right hand rules in Electromagnetism. When we move our fingers in different directions we are trying to model the four dimensional space of a Terreract.



Therefore this explains why Electric and Magnetic waves are at right angles to one another because they exist in a four dimensional hyperspace which interacts with our three dimensional space and are at right angles to one another.

So when we measure EM waves we find the waves at right angles to one another and this indicates their four dimensional origins in our three dimensional space.

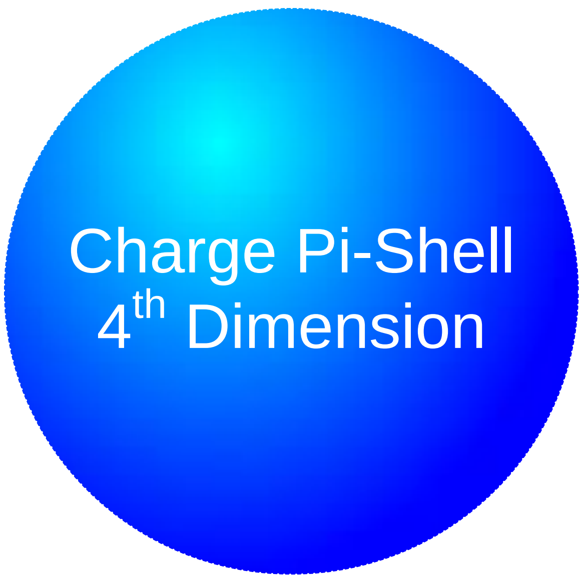


Therefore theoretically in Pi-Space, all of Maxwell's Equations are really an attempt to model four dimensional vibrations in a three dimensional space which is where we exist.

1.22 Electric Charge As A Four Dimensional Pi-Shell

In Pi-Space we model electric charge as a four dimensional Pi-Shell relative to Local Space. It is a higher dimension which itself has three dimensions so it looks just like a normal Pi-Shell in this dimension. Curled up inside this four dimensional space are our Local three dimensions where we have Local mass for example. See the Tesseract for the four dimensional view. Please understand this concept before proceeding.

Charge particle wraps
around Local Three
Dimensional space



1.23 4D interacting with 3D Sharing Two Common Dimensions

In Pi-Space we use a “connected dimensions” reality. Higher dimensions share two common dimensions.

We connect three dimensions to four dimensions.

We adopt a "connected dimensions" approach.

The fourth dimension shares two lower dimensions and one additional unique one.

So it has two lower dimensions and one higher unique one.

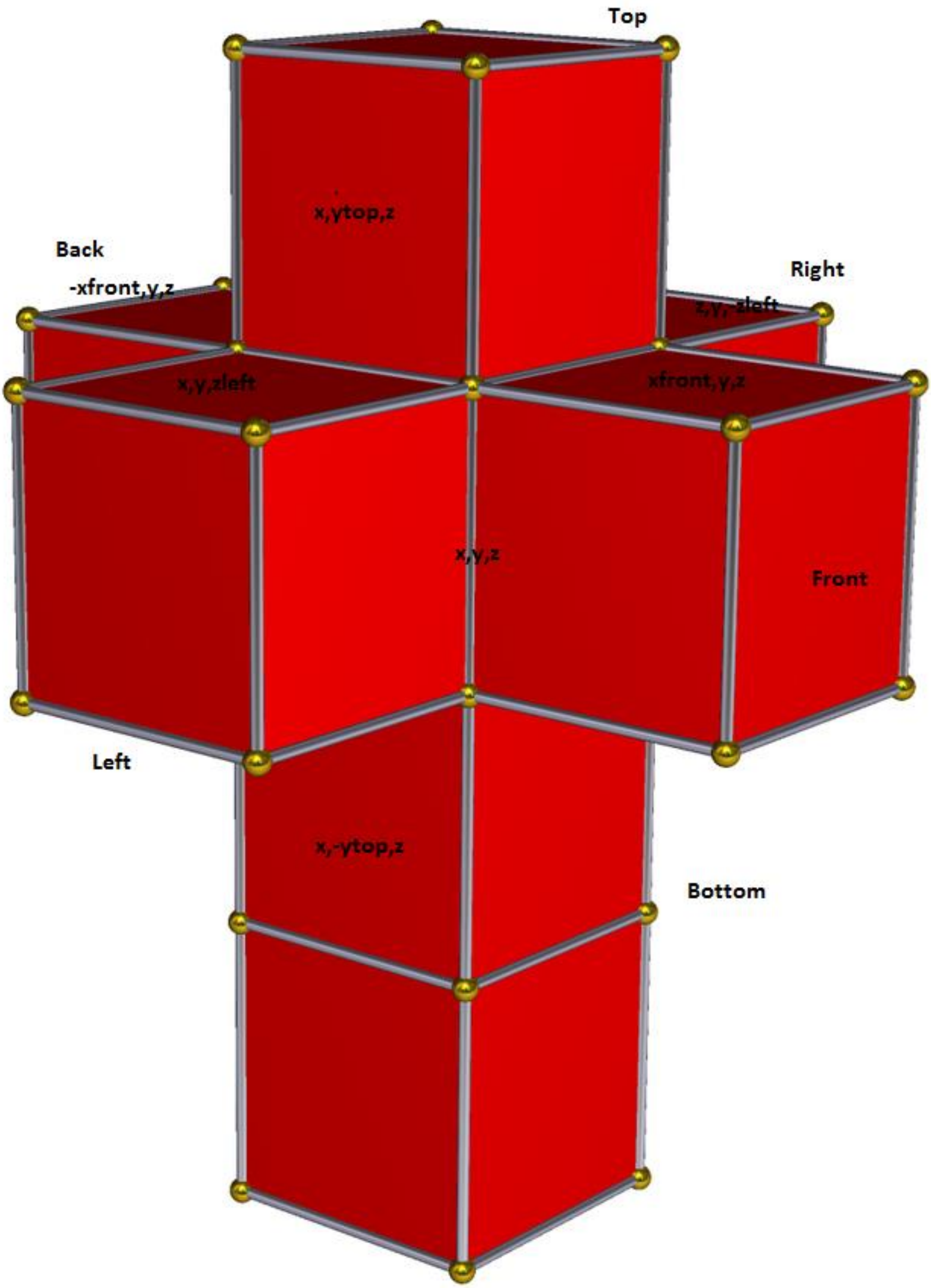
So the dimensions are connected.

Therefore a cube in the fourth dimension will appear as a flat object in our dimension because we share two dimensions only. In its "dimension space" however it will appear like a cube.

Dimensional space cubes occupy their own space time and are typically at right angles to others based on Tesseract model.

We can show the shared axes which are in pairs (xy, yz, xz),

.


Top
x,ytop,z
Back
-xfront,y,z
Right
z,y,-zleft
x,y,zleft
xfront,y,z
x,y,z
Front
Left
x,-ytop,z
Bottom

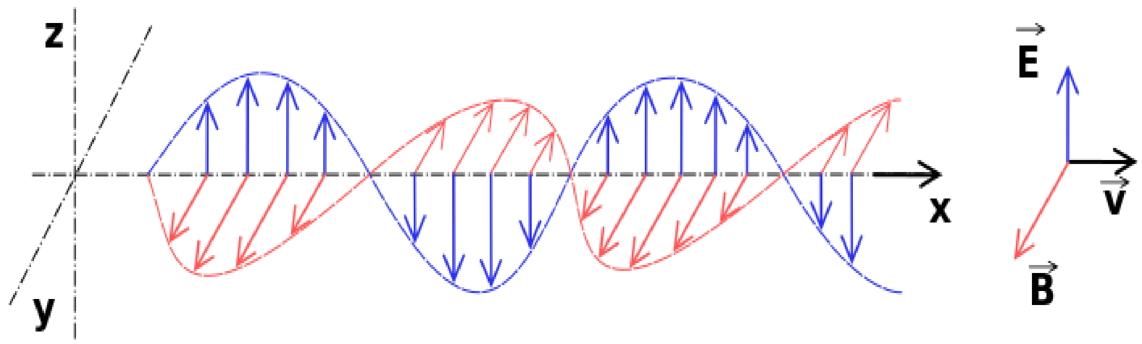
For example,

xfront,y,z

These share y,z so any movement in xfront,y,z/-xfront,y,z turns up as y,z movement in the inner x,y,z
e.g. magnetic wave

Electric wave is in x,y so this is movement in x,y,zleft and x,y,-zleft.

In our x,y,z reality what we see are oscillations at right angles to one another:



This is due to the 4 dimensional Pi-Shell oscillating around 3D.

The remainder of this discussion will be covered in a chapter covering Electricity and Magnetism. For now, I will move onto Fluids and Wave mechanics.